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THE IMMEDIATE MEMORY SPAN OF CHILDREN FROM "ADVANTAGED" AND "DISADVANTAGED" BACKGROUNDS.

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THREE GROUPS OF FIRST- AND SECOND-GRADE CHILDREN, TWO LOWER-CLASS AND ONE MIDDLE-CLASS, WERE ASKED TO LEARN AND RECALL SEQUENCES OF WORDS AT FOUR LEVELS OF CONCEPTUAL DIFFICULTY--NONSENSE SYLLABLES, HIGH FREQUENCY NOUNS, ANOMALOUS SENTENCES, AND MEANINGFUL SENTENCES. IT WAS HYPOTHESIZED THAT THE STUDENTS' VERBAL MEMORY WOULD INCREASE WITH INCREASES IN AGE AND SOCIAL CLASS LEVEL AND AS THE WORDS ACQUIRED MEANING AND STRUCTURE. STUDENTS' SCORES ON AN AUDITORY MEMORY TEST REVEALED THAT IT WAS EASIER FOR THE CHILDREN TO LEARN GRAMMATICALLY STRUCTURED--AND THUS MEANINGFUL--INFORMATION. HOWEVER, THOUGH THE OLDER CHILDREN IN GENERAL LEARNED BETTER THAN THE YOUNGER CHILDREN, THEY DID NOT NECESSARILY LEARN MORE AS THE TASK LEVEL INCREASED. MOREOVER THERE WERE NO SIGNIFICANT DIFFERENCES IN THE MEMORY SPAN OF LOWER-CLASS AND MIDDLE-CLASS CHILDREN. THUS THE MIDDLE-CLASS CHILD'S GREATER FAMILIARITY WITH SYNTACTICAL LANGUAGE DID NOT GIVE HIM AN ADVANTAGE OVER THE LOWER-CLASS CHILD IN THIS STUDY. (LB)

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The Immediate Memory Span of Children from "Advantaged" and "Disadvantaged" Backgrounds[1, 2]

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3 samples of children differing in socio-economic background from both the first and second grades were asked to recall strings of information at 4 levels of conceptual difficulty: nonsense words, high frequency nouns, anomalous sentences and meaningful sentences. There were non-significant differences between the children at each of the 4 levels. These results duplicate the findings of prior research with meaningless strings of numbers but go beyond these earlier studies to demonstrate that the auditory memory of these lower and middle class children is also similar on meaningful tasks.

The level of a child's cognitive development is to a great extent expressed in his ability to interpret and utilize the structure of his environment. Bruner concluded a recent study on the development of equivalence transformations with the question, "May it not be the case that development consists of finding techniques for being simple with respect to information [Bruner & Olver, 1965, p. 434]?" Simplifying techniques are needed because the information processing ability of humans is dependent on rather inflexible input limitations (Miller, 1956; Broadbent, 1958). Humans increase their capacity to deal with information not so much by increasing their immediate memory span as by recoding and condensing.

Differences in familiarity with the constraints of a given language or dialect can result from experiential as well as age differences. Children from lower social class (LSC) homes often have not had as much experience with the complex language structure as their middle class (MSC) counterparts. The language of the LSC is characterized by distinctive grammatical and semantic features (Bernstein, 1960; McCarthy, 1954; Templin, 1957). In other words, the contextual constraints within the LSC dialect are different from those in the dialect of the MSC.

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In an earlier study (Barritt, Semmel, & Weener, 1966), it was found that tasks which required memory for unstructured sequential materials did not distinguish between lower and middle social class groups. On tasks which required syntactic, morphemic and vocabulary skills the LSC group was lower than the MSC group. The difference in language experience between the two social groups seemed to be reflected in tasks which required knowledge of the contextual

constraints within their language, but was not reflected in language tasks without structural features. The purpose of this study was to investigate the differential effects of structural features on the immediate memory span of children from different age and social class levels. It was hypothesized that:

Hypothesis 1. Children recall more information from tasks which contain semantic and/or syntactic language features than from tasks which do not contain these language features.

Thus, it is easier for children to recall a meaningful, grammatical sentence than a meaningless, grammatical (anomalous) sentence, and further that it is easier to recall an anomalous sentence than a non-grammatical, meaningless string of words.

Hypothesis 2. The increase in verbal recall resulting from increased semantic and/or syntactic features is greater for older children than for younger children.

The greater familiarity of older children with the semantic and syntactic children with the semantic and syntactic features of their language facilitates the recall of messages which contain these features. For example, first and second graders would be more alike on memory for a string of nonsense words than for meaningful sentences. The difference between the two groups in favor of the second graders would be greater when meaningful sentences were recalled than when nonsense words were recalled.

Hypothesis 3. The increase in verbal learning resulting from increased semantic and/or syntactic features is greater for children from middle social class homes than from lower social class homes.

The greater familiarity of middle social class children with the semantic and syntactic features of their language facilitates their recall of verbal messages which contain these features as compared to the recall of a lower social class sample on the same messages. The differences between the two groups would be more in favor of the middle social class group on the recall of meaningful sentences than on the recall of strings of nonsense words.

Procedure

Children from three schools at two age levels were tested. The social class status of the children was defined in terms of their place of residence and the school attended (See Barritt, Semmel, & Weener, 1966, for complete description of samples). The children in Groups 1 and 2 came from LSC neighborhoods; Group 3 children lived in an MSC neighborhood. Two different grades or

ages are represented in each sample. The first grade sample ranged in age from 77 months to 87 months with a mean of 83.4; the second graders ranged from 88 months to 110 months with a mean of 96.3. The first grade samples from the three groups contained 19, 19, and 16 subjects (Ss) respectively; the second grade samples from the three groups contained 18, 23, and 24 Ss respectively.

An instrument was constructed to measure auditory memory at four different levels of verbal structure (see Appendix I). Items in the first task level consisted of CVC trigrams selected at random from the Underwood and Shulz (1960) lists with meaningfulness ratings in the 30-70 range. The second task level contained nouns selected randomly without replacement from the 500 most frequent words in the original Thorndike count, excluding common homonyms (Thorndike & Lorge, 1944).

The third and fourth level tasks contained sentences with respective items at each level having the same grammatical structure. Level 3 items are meaningless sentences (anomalous) and Level 4 sentences are meaningful. Using the sentence frames of the Level 4 items, Level 3 sentences were generated by selecting words of the proper form class from the pool of words made up of the words used in Level 4 sentences.

The entire auditory memory test was recorded and presented to the Ss on a MagMatic Tape Repeater. The words in Levels 1 and 2 were read as a list at the rate of 1 unit per second. The sentences of Levels 3 and 4 were read with normal sentence inflection at the rate of 3 words per sec. Lists were presented in four different orders based on a balanced 4 x 4 Latin square. Each S was asked to recall the words in the proper order. Only one trial was given for each item and the ceiling was established at two incorrect items in each list. Ss' responses were tape-recorded and scored later as an immediate memory span task. A S's score for each level was the number of words in the last item correctly recalled.

Results and Discussion

The raw score means and standard deviations for all groups at all task levels are presented in Table 1. Because of heterogeneity of variance across task levels, the raw data were transformed by a logarithm transformation, $y = \log (x + 2)$, for the subsequent two-way analyses-of-variance.

Insert Table 1 about here

Hypotheses 1 and 2 were tested using a two-factor repeated-measures design (Winer, 1962, p. 302) with age (A) and task level (B) as the two factors. Hypothesis 1, that increasing amounts of information would be recalled as language habits were required, was confirmed with a significant B main effect ($F = 527$). Hypothesis 2, that older children would recall increasingly more than younger children as the task level increased, was not confirmed, since the age-by-task-level interaction was not significant ($F = 1.54$). The age main effect (A) was significant ($F = 4.8$), indicating that over all task levels the older children recalled more words than the younger children. The raw score values used in this analysis are plotted in Figure 1.

Insert Figure 1 about here

Hypothesis 3 was tested using the same statistical model described above. Social class and task level were factors. The analysis was done separately for each grade to prevent the confounding of age effects with social class effects. In the grade one analysis, Hypothesis 3 was confirmed with a significant group-by-level interaction term. In looking at the raw score values presented in Figure 2, it can be seen that differences at both Levels 1 and 4 contributed to the significant interaction. A more satisfying confirmation of Hypothesis 2 would have shown no differences at Level 1 with the difference between the MSC and LSC samples increasing at each successive task level. The same analysis for second grade children yielded no significant interaction (see Figure 3 for raw score values). The social class main effect was not significant in either analysis. That is, across all task levels the MSC group did not have a significantly greater memory span than the LSC group.

Insert Figures 2 and 3 about here

The results of the present study are equivocal. Hypothesis 1, a rather trivial prediction, was confirmed. Children do remember more words when those words are related to one another in some way which is consistent with their past language experiences. These same children remember less when there are no constraints placed upon the occurrence of items in a string, as in Levels 1 and 2, particularly.

An examination of Table 2 indicates that though Hypothesis 2 was not confirmed by a significant interaction term in the analysis of variance, the trend of mean difference favors the prediction. Tests of the four differences confirm this inspection. The t's for Levels 2, 3, and 4 are significant while there is no reliable difference between these seven- and eight-year-old children on the nonsense word task.

The final hypothesis predicted smaller differences between LSC and MSC children at Level 1 with increasing differences between groups on Levels 2 through 4. This effect was not observed. The significant interaction of level by social class for the first grade Ss does not reveal the predicted trend. Inspection of the raw score means shows that this effect is due to differences at Level 1 as well as Level 4.

It would seem that our memory task, though sensitive to age effects, is not sensitive to social-class differences in language performance. This is true even though we know that these groups are different on other language measures (Barritt, Semmel, & Weener, 1966). Immediate memory span for both structured and unstructured verbal tasks seemsto be relatively unaffected by the experiences which are associated with social-class differences.

There is presently under way a replication of this study with similar stimulus materials using three age groups of two widely divergent social class groups. This new study is intended to determine whether Hypotheses 2 and 3 would be supported if the range of the social class and age factors were expanded. Support for these hypotheses was not provided with the present sample.

Footnotes

[1]The research reported herein was performed pursuant to Contract OEC-3-6-061784-0508 with the U.S. Department of Health, Education and Welfare, Office of Education, under the provisions of P.L. 83-531, Cooperative Research, and the provisions of Title VI, P.L. 85-864, as amended. This research report is one of several which have been submitted to the Office of Education as Studies in language and language behavior, Progress Report V, September 1, 1967.

[2]This report is based on a paper presented at the AERA Meeting, New York City, February 17, 1967.

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Figure Captions

Fig. 1. A comparison of raw score means at four task levels for first and second grade groups.

Fig. 2. A comparison of raw score means at four task levels for first grade children in three samples.

Fig. 3. A comparison of raw score means at four task levels for second grade children in three samples.

APPENDIX I

Immediate Memory Test

Level 1

Item 1:	cax	zab				
Item 2:	dup	mav	tuz			
Item 3:	kuv	rof	fup	nid		
Item 4:	mub	fip	gak	bem	sib	
Item 5:	yod	tud	wib	paf	nus	mef

Pronunciation key: a as in bat, e as in bet, u as in but, o as in go, i as in bit.

Level 2

Item 1:	watch	hill					
Item 2:	gold	church	land				
Item 3:	night	king	men	school			
Item 4:	hand	wind	house	corn	bed		
Item 5:	ball	rain	world	street	year	arm	
Item 6:	wall	mild	word	stone	tree	friend	food
Item 7:	man	air	light	sound	bud	box	death	place

Level 3

Item 1: A truck opened today.

Item 2: Today his man has black fire.

Item 3: The little curly trees ran at a door.

Item 4: A path for new black tails looked down the hand.

Item 5: On the girls she ran over the big friend with some umbrella.

Item 6: The snowman and garden lady, a teacher went in and down as they flew.

Item 7: Old cow and his street slowly jumped up a red kitten to a black, new book.

Level 4

Item 1: The door opened slowly.

Item 2: Today all pigs have curly tails.

Item 3: A little old lady ran down the street.

Item 4: A man on his red truck looked at the fire.

Item 5: Over the trees she flew with a black umbrella in her hand.

Item 6: The snowman and his friend, the cow, jumped up and down as they sang.

Item 7: His kitten and my turtle slowly walked down the garden path to the big, red barn.

Item 8: The boys and girls went with their teacher to buy some books about pets for their new school.

Table 1

Raw Score Means and Standard Deviations at Four Task Levels for Three Groups at Two Grade Levels

		L-1		L-2		L-3		L-4	
		$\bar{X}$	S	$\bar{X}$	S	$\bar{X}$	S	$\bar{X}$	S
Group 1 (Low SES)	Grade 1 n = 19	1.00	1.08	3.53	.68	6.84	2.18	10.00	2.97
	Grade 2 n = 18	1.44	1.21	3.78	1.03	7.11	2.42	10.94	2.59
Group 2 (Low SES)	Grade 1 n== 19	1.84	.67	3.26	.91	6.11	2.47	10.00	2.25
	Grade 2 n = 23	1.35	1.00	3.81	1.03	6.26	2.82	11.74	1.22
Group 3 (High SES)	Grade 1 n = 16	1.69	1.10	3.50	1.12	6.38	2.76	11.38	2.98
	Grade 2 n = 24	1.71	.87	4.04	.54	8.42	2.77	11.50	2.72

L-1 Level one - nonsense words

L-2 Level two - common nouns

L-3 Level three - anomalous sentences

L-4 Level four - meaningful sentences

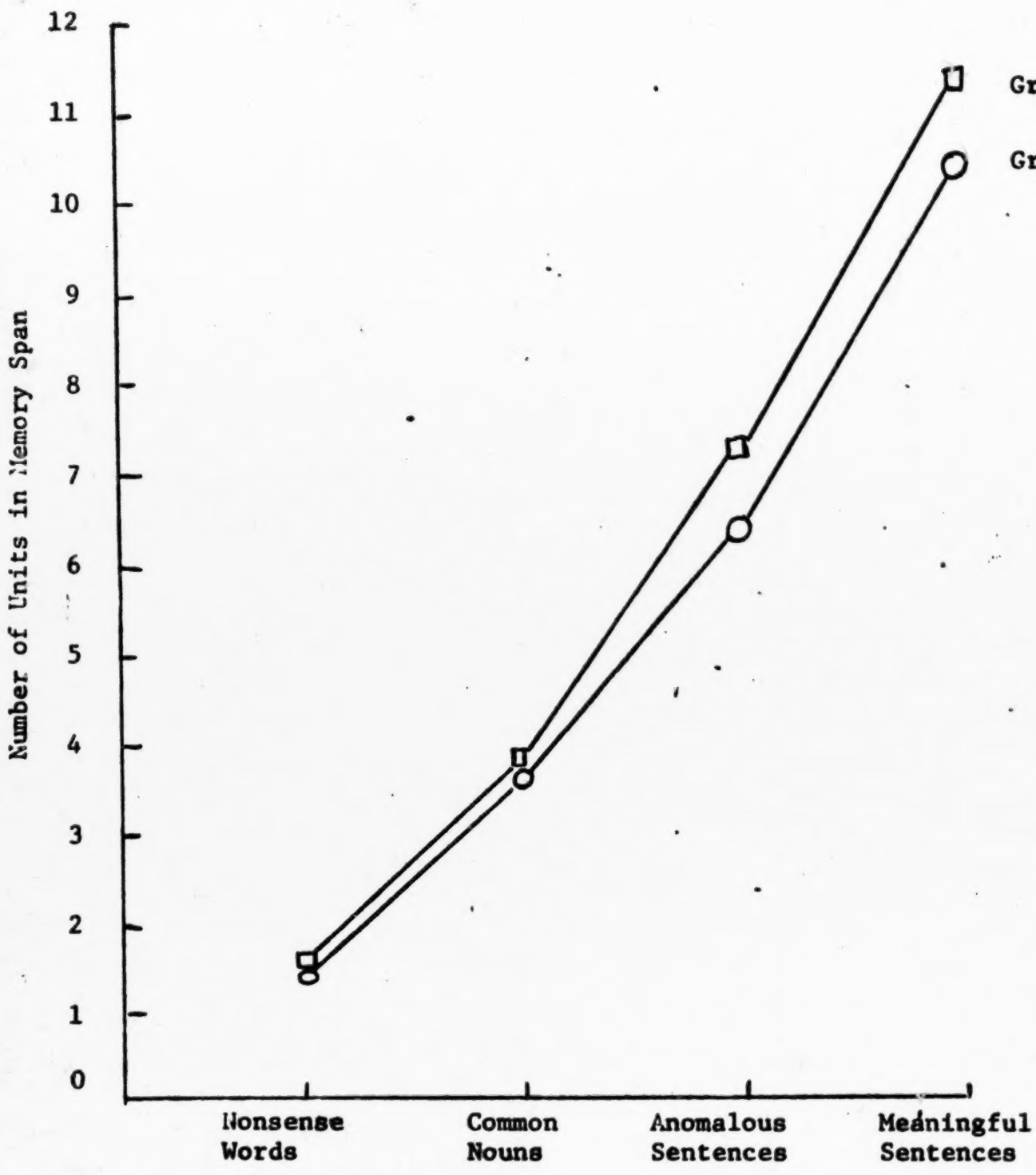
Number of Units in Memory Span
12
11
10
9
8
7
6
5
4
3
2
1
0
Grade 2
Grade 1
Nonsense Words
Common Nouns
Anomalous Sentences
Meaningful Sentences

Figure 1

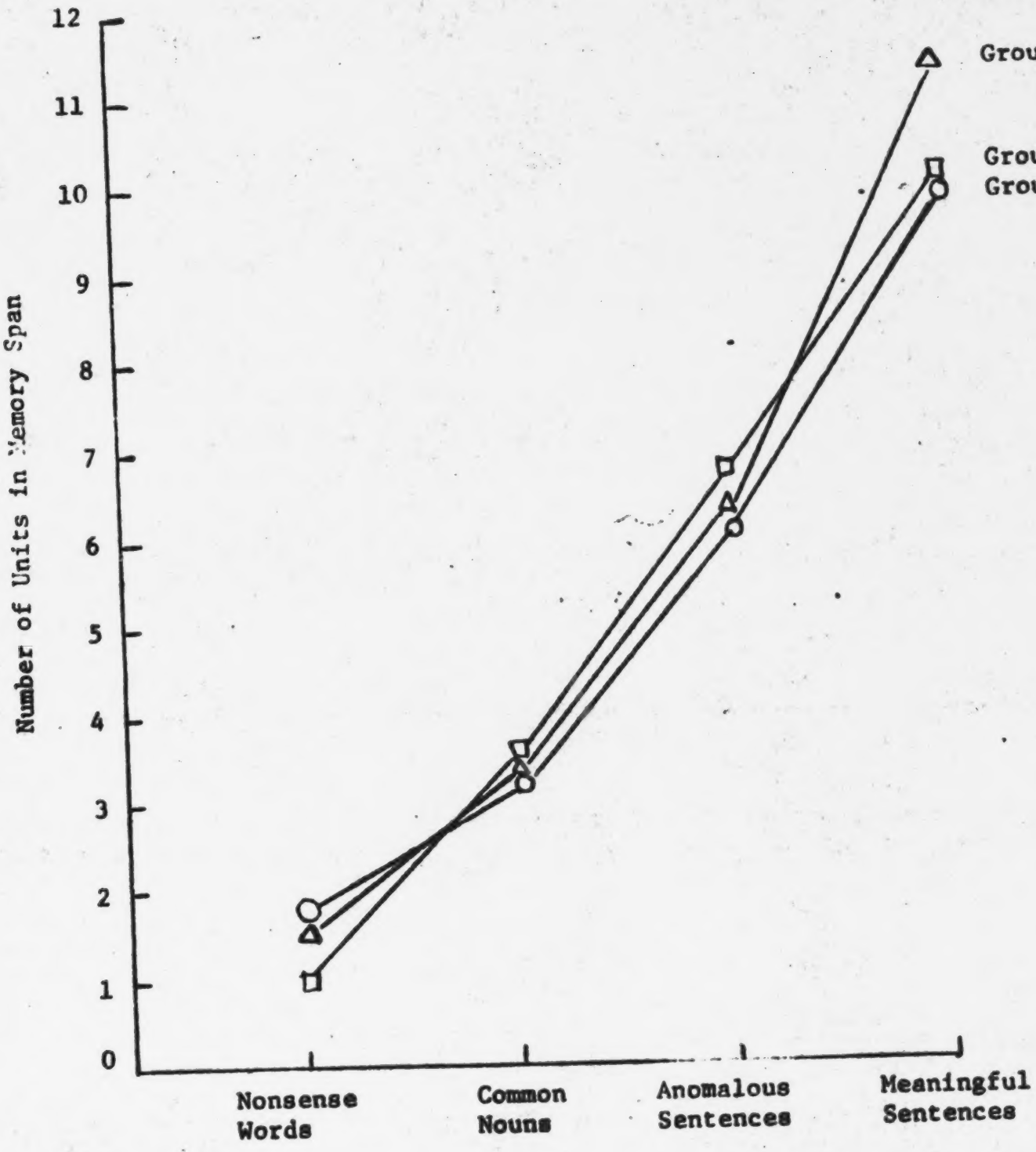
Number of Units in Memory Span
0
1
2
3
4
5
6
7
8
9
10
11
12
Nonsense Words
Common Nouns
Anomalous Sentences
Meaningful Sentences
Group 3
Group 1
Group 2

Figure 2

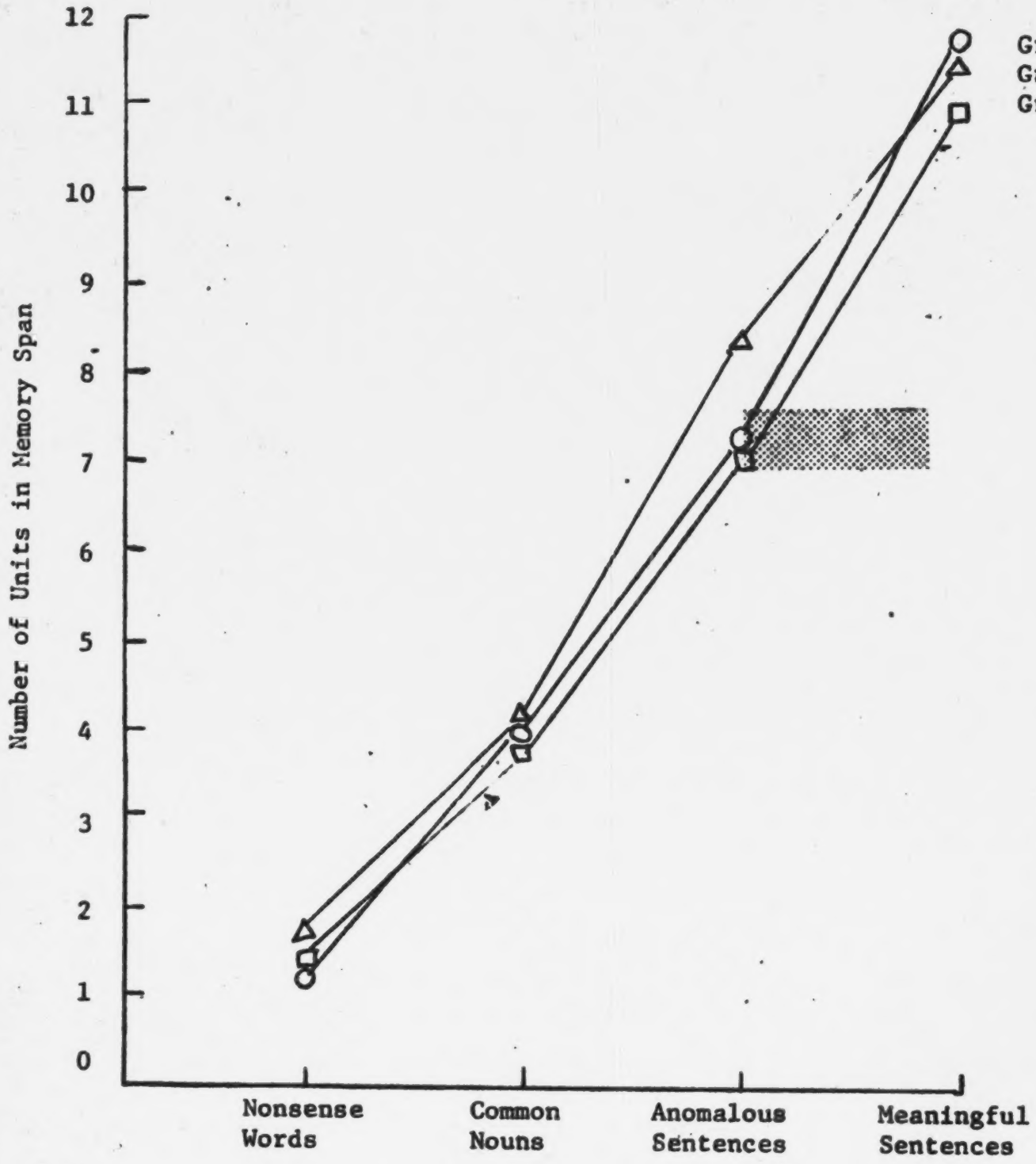
Number of Units in Memory Span
12
11
10
9
8
7
6
5
4
3
2
1
0
Group 2
Group 3
Group 1
Nonsense Words
Common Nouns
Anomalous Sentences
Meaningful Sentences

Figure 3